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The effects of the program Improving classroom instruction through self-analysis" (Parsons, 1975) on the characteristics of verbal interaction in classroom settings

Robert Whitman Smith
University of the Pacific

THE EFFECTS OF THE PROGRAM "IMPROVING CLASSROOM INSTRUCTION THROUGH SELF-ANALYSIS" (PARSONS, 1975) ON THE CHARACTERISTICS OF VERBAL INTERACTION IN CLASSROOM SETTINGS

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Robert Whitman Smith

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INTRODUCTION

No one, however proficient, can make another person learn. But the methods used in teaching and the manner in which instructional content and materials are sequenced, will influence the ease with which a pupil learns new concepts, new language and new skills.

The good teacher is one who knows his pupils, has an operational understanding of the ideas and skills to be taught, and helps his pupils explore their individual and collective experiences and expand them into new learning.

For a teacher to improve his effectiveness, he must become aware of his own teaching techniques and ways his pupils respond to them. Therefore, a teacher must be given the means to see precisely what he does when he works with a child, a group, or the whole class. He needs the means to analyze both the form and content of his actions. He needs to assess their effectiveness and then he needs constructive suggestions to guide him in improving his teaching. [1]

Theodore W. Parsons, Director
Guided Self-Analysis System

The Improving Classroom Instruction Through Self-Analysis system, henceforth referred to as ICI, has been designed specifically to assist practicing classroom teachers in their own efforts toward professional self-improvement.

> Underlying the ICI system are two beliefs: 1) that a teacher's questioning strategy is indicative of his overall strategy; and 2) that in order to develop critical-analytic skills, students must be given opportunities to develop and use cognitive and verbal skills in the classroom. [2]

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[1] Theodore W. Parsons and Kenneth H. Crooks, Teaching For Inquiry (Berkeley: Guided Self Analysis Company, 1970), p. 8.

[2] Theodore W. Parsons, Teaching For Inquiry (Berkeley: Guided Self Analysis Company, 1974), p. 4.

The ICI system consists of materials which guide the teacher in analyzing his own teaching behavior, so that he can gain an objective understanding of his strengths and weaknesses. With the system the only observer is the teacher himself; it is he who will view and analyze the tapes. The classroom thus becomes the learning place for the teacher, as well as for his pupils.

The problem of dealing with the actual process of teaching is quite different from the construction and testing of curriculum content. In this case the focus is on the strategy of presentation, rather than the content of the presentation. This means that 1) an observational system to help the process of classroom interaction, and 2) a set of guidelines to help judge the effectiveness of different teaching strategies, or styles, are needed.

Some observation systems have been designed as research tools to aid the study of differences between teaching styles and to find out what actual teaching behavior is like; while other systems have been designed as practical tools for teachers themselves to use in analyzing their own teaching behavior. This "self-analysis" may be done for the purpose of simply finding out what one does in the classroom, or it may be part of a self-improvement procedure.

ICI has been designed to help teachers improve their teaching through the analysis of videotaped recordings of their own teaching.

The present study is concerned with testing the effectiveness of the ICI package in helping teachers improve their own teaching.

CHAPTER I

THE PROBLEM AND ITS SETTING

I The Problem

The Statement of the Problem

The study will focus on the assessment of the effects of ICI on the cognitive level of teacher questions and student answers.

The Subproblems

1. The first subproblem. The first subproblem is to determine if the ICI self-analysis treatment will result in greater use of higher level questions by teachers.

2. The second subproblem. The second subproblem is to determine if the ICI treatment will result in greater use of higher level answers by students.

3. The third subproblem. The third subproblem is to determine if the ICI treatment will result in greater use of encouraging responses, which sustain and extend pupil thought, by teacher to student statements.

II Improving Classroom Instruction Through Self-Analysis (ICI)

ICI is a G.S.A. (Guided Self-Analysis and Professional Development Systems) program to be published in the Spring of 1975. Its designer, Dr. Theodore W. Parsons, will publish the ICI package under the Prismatica International label.

ICI is similar to many observation systems which have been developed to study classroom interaction in that it can be used as a research tool for the purpose of studying actual teaching behavior. But unlike most systems of interaction analysis, ICI is unique as a means of self-analysis on the part of the teacher. Without the observation of trained behavioral scientists, the teacher is provided the means of analyzing and improving his own teaching.

The focus of the ICI program is on the cognitive level of teacher questions. The cognitive level of questions is defined in terms of a set of categories which are used to classify, or code, each observed question. In most observation systems the coding process can become very complex. In ICI, on the other hand, teacher questions are categorized in terms of only those levels of thinking which the author, Parsons, believes to be helpful to the teacher in learning how to ask more effective questions.

Parsons also emphasizes the cognitive level of student answers. Unlike the typical observation system, the program does not attempt to assess a large number of interaction characteristics; rather, it attempts to help the teacher isolate central classroom behaviors which are crucial to effective teaching.

ICI comes as a multi-media kit containing: 1) an instruction sheet; 2) a pre-recorded audio cassette; 3) master copies of coding forms and worksheets; and 4) four bound guidebooks -- a. Questioning for Pupil Experience, b. Questioning for Levels of Thinking, c. Responding to Pupils, and d. Patterns of Explaining.

With the aid of the multi-media kit, a teacher records selected portions of his regular classroom activities on audio or video tape. The guidebooks provide instructions for identifying and interpreting significant patterns of teacher behavior recorded on the tape. They include guidelines for improving teaching skills, and a series of self-development tasks. Each guidebook concludes with a set of "private workshops" that give immediate and practical help to the teacher who wants to improve his own patterns of classroom instruction through self-analysis.

Limitations of the Study

This study will focus on two categories of the ICI program, guidebook two - "Questioning for Levels of Thinking" and guidebook three - "Responding to Pupils." It will not attempt to measure student retention between teaching and learning in terms of the level of thinking which actually occurs during classroom discussion.

The study will be limited to an analysis of the ICI system as a model of effective teaching rather than a specific series of steps which a teacher must follow to become effective in the classroom.

III The Hypotheses

The first hypothesis is that the ICI treatment will result in increased use of higher-level questions by teachers in the experimental group, as compared to the control group.

The second hypothesis is that the ICI treatment will result in increased use of higher-level answers by students in those classes taught by teachers in the experimental group, as compared to the control group.

The third hypothesis is that as teacher questions move to higher levels of thinking, so will student answers.

The fourth hypothesis is that ICI treatment will result in increased use of encouraging responses by teachers in the experimental group, as compared to the control group.

IV Definitions of Terms

ICI. ICI (Improving Classroom Instruction Through Self-Analysis) is the name of the teacher self-improvement system under investigation.

Guidebooks. The manuals in the ICI system are referred to as guidebooks. There are four guidebooks in the program. Each guidebook focuses on one aspect of classroom interaction. This study will be concerned with guidebooks II and III.

Guidebook II. Guidebook II focuses teacher attention on questioning for levels of thinking. Questions are cues for student thought. The complexity of thinking depends largely on the kind of questions that a teacher asks. While some questions are for well-learned, rote responses, others ask the student to put experiences and bits of information together to form more complicated concepts. This guidebook will help the teacher categorize his questions according to the level and the complexity of the thinking tasks they make students perform.

Guidebook III. Guidebook III asks the teacher to categorize his responses. He decides whether his responses promote or inhibit further pupil thinking. Then he is helped to interpret the relation of his questioning strategy to his response patterns.

Cognitive Levels and Levels of Thinking. These terms refer to the conceptual content of classroom discussion as indicated by the coding data for Guidebooks II and III. This means that the conceptual level of the teacher's talk is determined by the level of thinking he asks for in his questions; correspondingly, the level of student thinking is determined by the cognitive level of student answers to teacher questions.

Questioning Strategy. A teacher's questioning strategy is defined as simply the questions which he asks in sequence during any given discussion.

Response Strategy. A response strategy is similar to questioning strategy, except that it is a record of the teacher responses to student talk during a given classroom discussion.

Coding and Coding Data. Coding refers to the use of a set of ICI categories to classify specified teacher and/or student behavior. In Guidebook II, the teacher is given a set of categories to use in coding each teacher question in terms of its cognitive level.

The coding is accomplished by watching a videotape of recorded classroom interaction, and entering each coding decision into an appropriate coding form.

CHAPTER II

REVIEW OF THE LITERATURE

The purpose of this chapter is to present the background of interaction analysis systems and to relate ICI to the study of the quality of verbal interaction in the classroom. The first part deals with ICI and other classroom observation systems. The second part considers the relationship between teacher questions and thinking levels in classroom discussions.

A. ICI AND OTHER OBSERVATION SYSTEMS

> The Improving Classroom Instruction Through Self-Analysis program is closely related to the work of Robert F. Bales, Edmund J. Amidon, Ned A. Flanders, and others who have used techniques of interaction analysis. These techniques employ analytic schemes for identifying units of behavior and "mapping" their relationships in space and time. The behavioral maps which result are then interpreted or analyzed according to the particular theoretical and/or value orientations which guide the observer. [1]

There are many interaction analysis techniques being used in the study of teaching behaviors. Simon and Boyer (1967 and 1970)[2]

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[1] Theodore Parsons, Teaching for Inquiry (Berkeley: Guided Self Analysis Company, 1974), p. 3.

[2] Anita Simon and Gil E. Boyer, Mirrors For Behavior: An Anthology of Classroom Observation Instruments (Philadelphia: Research for Better Schools, 1967 and 1970).

have anthologized 79 of the better known systems, and all of them are classroom interaction. Most of these systems utilize the following procedure: the observer sits in a classroom or other situation to view a video tape or to listen to a sound recording. Using a category system, he follows the flow of events attempting to identify units of behavior. A chart or record of each behavioral unit is then subjected to interpretation and analysis.

Although these systems focus attention on different aspects of classroom behavior, most are alike in that they organize their categories into a single scheme. The Amidon system, for example, contains five major categories for analyzing classroom verbal behavior. These categories are structured into a 17 X 17 matrix. The Flanders system includes ten basic categories which are structured into a 10 X 10 matrix. These systems require the observer to memorize the entire scheme and keep all the categories in mind while viewing a classroom discussion. Both the Flanders and Amidon systems require that ...

> Persons planning to use these systems in order to study verbal behavior in the classroom begin by memorizing the categories. Once these are learned so that response is automatic, tapes of various teaching situations are used for practicing the tally of categories. A category is tallied every three seconds, indicating the interaction which is occurring at that time. If the verbal behavior changes before the three second interval ends, this change

> is always recorded in sequence in a column, and approximately twenty numbers are written per minute.[3]

Most of the observation instruments, in an attempt to produce a thorough profile of classroom behavior, have become increasingly elaborate and complex. Of course, with increased complexity, problems arise revolving around the training of the observer and controlling for observer reliability. Some systems require that a trained observer be employed who "feeds back" the data to the teachers. In other systems a lengthy and expensive program for training teachers to do their own coding is required. However, McNally states...

> Efforts at teacher evaluation are far too narrowly focused, too over simplified; consequently they may omit important factors that are central in improvement of teaching. We are in need of a system by which we appraise the influence of all factors that shape the effectiveness of the teaching and learning process in the schools and the results which that process achieves.[4]

The latter method has not generally been too successful according to Parsons.

> In many cases teachers have been either unable or unwilling to devote the necessary time and effort to

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[3]Edmund Amidon and Elizabeth Hunter, Verbal Interaction In The Classroom (Columbia, Ohio: Charles E. Merrill Books, 1967) Professional Reprints in Education, No. 8605, p. iv.

[4]Harold J. McNally, Teaching Evaluation That Makes A Difference (Educational Leadership, Jan. 1972, Vol. 29, No. 4) pp. 53-54.

> the task of learning complex category systems and coding procedures. This can be a particularly difficult problem when teachers have only vague ideas of the value of the ultimate "pay off" or see it as being problematic. In other cases teachers have become so involved with the particular complexities of the coding systems and their use that their psychic energies have been expended in learning the coding systems, leaving little left over for self-analysis, motivation, etc. It is apparently common-place to find that those teachers who have learned to use one of the complex category systems limit their active concerns to problems of coding. [5]

Boyan's work with the Flanders system supports Parsons' conclusions.

> Examples of observations using the Flanders Matrix were analyzed for specific verbal behaviors and for patterns of verbal behavior of both teacher and pupils. The supervising teachers were trained in all phases of analyzing this matrix. The greatest part of the supervising teachers' analytic training occurred with the Flanders system. However, because of time constraints, the complexities of this analysis were by no means mastered by all the supervising teachers. Their proficiency in the use and analysis of this system was at best modest. [6]

There is evidence that interaction analysis techniques can produce a marked impact when used to research one's own behavior. But to the average teacher this impact cannot always be realized

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[5]Theodore W. Parsons and Kenneth H. Crooks, Teaching For Inquiry (Berkeley: Guided Self Analysis Company, 1970), p. 8.

[6]Norman J. Boyan, A Program For Training Supervising Teacher In The Induction Of New Professionals (Santa Barbara: University of California, 1971) p. 9.

unless a great deal of time and effort is placed into the analysis and interpretation of the coded data.

According to Parsons...

> Coding systems can be made meaningful and available if the following design is employed:
> 1. The categories are arranged into subsets, each of which may be used independently.
> 2. The categories are closely related in order to be used at one time.
> 3. Utilizing a videotape recorder for coding procedures.
> 4. The teacher himself does the "work" of analysis. [7]

By implementing the above strategies, it becomes possible to induce complex insights in an orderly and understandable way. Cooper and Stroud believe that...

> There is a widespread feeling in education that the feed back provided by videotape alone produces behavior change, but evidence from work with micro-teaching supports the conclusion that unstructured self-observation is ineffective as a means of changing behavior. [8]

By replaying a videotape record of his own classroom behavior, each time using a different set of the coding categories, a teacher can build a picture or structure of his teaching behavior. Each time he plays the tape he codes and analyzes for a separate but related set of behaviors. Because this procedure enables the teacher

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[7] Parsons and Crooks, op. cit., p. 8.

[8] James M. Cooper and Thomas Stroud, Micro-Teaching: A Description (Stanford University, 1967) p. 17.

to develop an awareness of his teaching behavior, it is capable of producing high impact upon teacher behavior.

In his review of film and videotape feedback, Baker observes...

> In any case, feedback, self-confrontation, or what ever, unless accompanied by appropriate shaping behavior or some kind of focusing, has not been found to significantly change behavior... Cooper and Stroud (1967) commenting on the use of videotape in feedback to student teachers state that "the most inefficient use of the video tape is to replay the entire lesson and just sit and watch it. The supervisor needs to point out the specific things... on which he wants the intern to focus. He needs to replay small segments to emphasize or clarify certain points." Thus, Bush also, in the same context of micro-teaching, states that a person's viewing of self on video tape, with no one else present, turned out to be very ineffective in terms of a teacher's learning behavior. He states that "it appears that the trainee in viewing the behavior has no idea of what to look for" (Bush, 1967), further, he found that in an experiment to test this very point, trainees who had been cued, learned desired teacher behavior to a significantly greater degree than trainees who did not receive this cueing.[9]

The ICI program has this impact because it allows the teacher to see his actual behavior patterns and, for the first time, guides him toward an analysis of those patterns. When a teacher follows the ICI procedure he becomes aware that perhaps his teaching behavior is not at all what he always assumed it to be.

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[9]Harry Baker, Film and Video Tape Feedback: A Review of the Literature (Austin, Texas: Texas University Research and Development Center for Teacher Education, 1970), p. 12.

Unlike other systems of interaction analysis, ICI is designed as a procedure for staff development. The ICI procedure has been structured to aid the teacher in becoming aware of the differences between his idealized images of his own classroom behavior and the real situation. This realization or awareness is a precondition for behavior change because, as Amidon says...

"Only the teacher can make changes in his classroom behavior."[10]

ICI provides a set of guides that help the teacher change his behavior. Through repeated taping and analysis, the procedure also provides a means for the teacher to measure the success of his efforts.

Although ICI gives the teacher a means of analyzing what he is doing, it does not give him a "method" of teaching. Videotape provides the teacher with a look at himself, and the ICI coding categories enable him to evaluate the effectiveness of his teaching. Now the teacher can find out whether or not he is asking any higher-level questions. It is assumed that once he sees what he is doing, the teacher will be motivated to plan and implement improved questioning strategies. It is also assumed that in doing so he will

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[10]Amidon, op. cit., p. 10.

model his behavior after the information given in the ICI materials. Duval believes that...

> Teachers can improve if they are able to gain objective insights into their own teaching behaviors. But such insights can rarely be given to a teacher by an observer, who may not know the specific classroom situation. Knowledge gained by self-analysis is the most meaningful, and the most likely to produce constructive change. [11]

ICI as a training procedure can be contrasted with the minicourse developed by the Far West Laboratory. [12] The minicourse materials are based on the microteaching concept which was developed at Stanford University. [13] Both ICI and the minicourse utilize videotape feedback, and both have materials which focus on the thinking levels of teacher questions. The central difference between the two systems is that the minicourse focuses teacher attention on filmed examples of desired behavior, or models, whereas ICI concentrates on the teacher's analysis of his own teaching.

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[11] John Duval, Self Analysis, (Office of Education, Bureau of Educational Personnel Development, 1970) p. 8.

[12] Walter R. Borg, The Minicourse: A Microteaching Approach To Teacher Education (Beverly Hills: MacMillan Educational Service Inc., 1970) p. 23.

[13] Robert N. Bush and Dwight W. Allen, Micro-Teaching: Controlled Practice in the Training of Teachers. (In James M. Cooper and Thomas Stroud, Micro-Teaching: A Description, Stanford University, 1967) p. 28.

In both programs, the teacher makes and analyzes videotapes of himself teaching. With the minicourse, the purpose of this feedback is to help the teacher model the teaching skills which he has viewed in training films. Tapes are made in a special classroom, with only a handful of selected students, and last only a few minutes--the micro teaching concept.

According to Berliner...

> The assumption is that the teacher needs to practice new skills in a secure setting that will encourage him to change, and in a controlled atmosphere where he can concentrate on learning to use the new skills. Once he has practiced these skills in the controlled setting, the teacher can go about the business of putting them to use in the normal classroom circumstances. [14]

Micro-teaching is a scaled-down teaching encounter which was developed at Stanford University to serve three purposes...

1. as preliminary experience and practice in teaching;
2. as a research vehicle to explore training effects under controlled conditions, and
3. as an in-service training instrument for experienced teachers.

> In micro-teaching the trainees are exposed to variables in classroom teaching without being overwhelmed by the complexity of the situation. They are required to teach brief lessons (5 to 25 minutes) in their teaching subject, to a small group of pupils (up to 5). These brief lessons

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[14]David C. Berliner, Microteaching and the Technical Skills Approach To Teacher Training. (Technical Report No. 8, Stanford: Stanford Center for Research and Development in Teaching, 1970) p. 38.

> allow opportunity for intense supervision, videotape recording for immediate feedback, and the collection and utilization of student feedback... Micro teaching clinics focus on instructing interns in the use of certain technical skills of teaching and allowing the interns the opportunity of practicing these skills in the micro-teaching clinic under the close supervision of a trained supervisor.[15]

In his analysis of the Guided Self-Analysis system, the initial self-analysis program developed by Parsons in 1970 and the system ICI is patterned after, Crooks states...

> Micro-teaching is skill-oriented. The skills which it presents to the teacher are discrete units of behavior. These can often be written in the form of rules, e. g., don't repeat your own questions, don't answer your own questions. Guided Self Analysis does not present the teacher with modeled teaching skills. The teacher uses the coding categories to identify the levels of thinking required by his questions, but he is not given specific instructions in asking higher-level questions. The Guided Self-Analysis videotapes are made by the teacher himself during normal discussions in his own classroom. Thus, the Guided Self Analysis system helps the teacher find out what he is doing in his teaching, and it is assumed that this knowledge will lead him to plan improvements.[16]

Amidon concurs with Crooks on the point that self-awareness will lead to improvements in teaching behavior; however, he feels that the teacher must also accept professional guidance because...

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[15]Cooper and Stroud, op. cit., p. 42.

[16]Kenneth H. Crooks, The Effects of Guided Self Analysis on the Conceptual Level of Verbal Interaction in the Classroom. (Unpublished Doctoral dissertation, Berkeley: 1972). p. 77.

> "few teachers are likely to take the time to perfect this type of skill on their own."[17]

Like Guided Self Analysis, the ICI package seeks to motivate change in the teacher's patterns of behavior. The teacher is not asked to conform to a model of effective teaching skills because...

> "Every teacher has his own style and will resist, quite naturally, infringements on it..."[18]

In the minicourse and micro teaching situations, the teacher is directed to change in specific ways. In ICI, the teacher chooses to make improvements based on his analysis of his teaching.

As to the question of which type of training is more effective, there is some evidence showing that the mini and micro-teaching course programs effect positive changes in teaching behavior, but this investigator has found no evidence that these changes are long lasting. The same might be true of ICI. But this question cannot be answered in the present study. It must be remembered that if a training program is to be effective, the people who receive the training must be able to master the skills it presents. In the case of the mini and micro-teaching courses, it is not simply a question of whether the teacher can initiate the appropriate new skills back in the

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[17]Amidon, op. cit., p. 12.

[18]Robert G. Hanvey, Teaching Plan: Studying Societies, Patterns In Human History (New York: The Macmillan Co., 1971) p. 10.

classroom. ICI does not rely on special settings for training. It seems more likely, to this investigator, that a training program which functions under normal conditions will lead to changes in normal classroom practice.

B. TEACHER QUESTIONS AND THINKING LEVELS IN CLASSROOM DISCUSSIONS

> Students sometimes interpret questions as attempts to entrap, to get them out on a limb, only to have the limb sawed off by the teacher... Students often feel threatened by questions, especially when they don't understand why the teacher is questioning them. Notice how often students respond to a question with one of their own.[19]

Perhaps the reason for a student's failure to understand a question or a student's inability to understand why a question is being asked is explained by Sanders' interpretation of good questions.

> Traditionally, questions have been used to determine what has been learned. Too often as isolated bits of knowledge which are of little value. Thus, there is a wide range in the quality of questions... There is a marked difference in the competence of teachers in the art of questioning. The teachers most talented in questioning are usually deep and continuating scholars. Good questions recognize the wide possibilities of thought and are built around varying forms of thinking. Good questions are directed toward learning and evaluative

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[19]Dr. Thomas Gordon, Teacher Effectiveness Training (New York: Peter H. Wyden Publishing Co., 1974) p. 86.

> thinking, rather than determining what has been learned in a narrow sense.[20]

Many investigators agree that teacher questions are the key to conceptual activities in classroom discussions. Parsons and Tikunoff conclude...

> There is a considerable body of research which indicates that more than 50% of the communication between teachers and pupils is in the form of questions. Teachers use questions to stimulate language production in children, to stimulate thinking in children, and to stimulate activity in children. Through questions, most teachers seek to involve pupils in classroom discussions and learning activities. There is also a considerable body of research to indicate that only approximately 20% of all classroom talk is pupil talk. This means that, while teachers generally ask large numbers of questions, these questions in effect, stimulate limited response from pupils.[21]

Questions prompt student thinking, and the level of thinking required by a question often determines the level of thinking given in the answer. Many researchers have tried to define the difference between questions which require little thought and those which are thought provoking. But there has been little agreement among

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[20]Norris M. Sanders, Classroom Questions (New York: Harper and Row, 1966) p. 18.

[21]Theodore W. Parsons and William Tikunoff, Improving Classroom Communication Through Self Analysis, (El Segundo, Calif: Prismatica International, Inc., 1974) p. 175. Experimental Copy.

observers concerning the nature of higher-level questions other than to agree that some questions require more thought than others.

The majority of questions normally used by teachers fall under the category of simple recall of facts. According to Borg in his review of the literature on the nature of teacher questions...

> The findings, then are quite consistent from study to study, even though in some instances there are deficiencies in methodology, such as failure to report interrater reliability in classification of questions, and lack of clarity in definition of certain question categories. It seems reasonable to conclude that there has been almost no change over a half-century in the types of questions teachers ask pupils. About 60 per cent of teachers' questions require simple recall of facts. About 20 per cent call for a thought response. The remaining 20 per cent are procedural. [22]

According to Bellack, the teacher dominates verbal activity in classroom discussion.

> The teacher not only dominates the verbal activity in the classroom discussion, but the preponderance of questions for both teacher and student involve low-level thinking, i. e., fact stating. Higher level thinking takes up less than 10% of discussion time. The overall pattern is one in which the teacher sets the problem (structures), asks a factual question (solicits), receives a factual answer (student response), and evaluates or comments on that answer (reacts). [23]

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[22]Borg, op. cit., p. 46.

[23]Arno A. Bellack, The Language of the Classroom (New York: Teacher College Press, 1966) p. 51.

But whatever the type of discussion strategy, most studies conclude that teachers manage discussions with a concentration on questions of fact. Flanders has summarized this in what he calls "the rule of two-thirds":

> Teachers spend two-thirds of class time talking themselves, and two-thirds of that time is spent in talking about questions of fact.[24]

All investigators agree that the conceptual level of classroom discussion would be higher if teachers were to use higher-level questions. However, there is little evidence to support this claim, and little agreement among investigators concerning the nature of higher-level questions.

> Prior to the development of probing and higher order questioning techniques comes the skill of asking questions. Too often beginning teachers lecture and tell students rather than asking questions which can elicit the answers from the students themselves. Training techniques have been developed by which teachers can see model videotapes of teachers demonstrating this skill, and by practicing in a micro-teaching situation increase the number of questions which they ask of students.
>
> Higher order questions are defined as questions which cannot be answered from memory or simple sensory description. They call for finding a rule or principle rather than defining one. The critical requirements for a "good" classroom question is that it prompts

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[24]Ned A. Flanders, Analyzing Teaching Behavior (Mass: Addison-Wesley, 1970) p. 24.

> students to use ideas rather than just remember them. Although some teachers intuitively ask questions of high quality, far too many over-emphasize those that require only the simplest cognitive activity on the part of the students. Procedures have been designed to sensitize beginning teachers to the effects of questioning on their students and which provide practice in forming and using higher order questions. [25]

Bloom's Taxonomy represents an attempt to enumerate the different kinds of operations which make up thinking. The Taxonomy contains six categories which have strongly influenced classification systems: knowledge, comprehension, application, synthesis, and evaluation. [26] Crooks concludes...

> But in utilizing Bloom's Taxonomy as an observational system one finds that it is easy to recognize recall or cognitive memory statements but when dealing with higher order questions or talk segments, a single teacher question will often ask for comprehension, evaluations, and some form of higher-level thinking all at the same time. In such cases, the coding decision depends on the coder's individual interpretation, not on the category definitions themselves. Similarly, analytic and synthetic thinking is very difficult to code and is often coded on the basis of the coder's impression of the classroom discussion, and not on actual evidence for one or the other type of thinking. [27]

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[25] Bush and Allen, op. cit., p. 72.

[26] Sanders, op. cit., p. 12.

[27] Crooks, op. cit., p. 106.

The popularity of Bloom's model as a basis for multiple classification systems seems to lie in the idea that the Taxonomy covers all types of thinking that occurs in the classroom. Yet the Taxonomy is difficult to apply in a systematic and meaningful way to conversation in the classroom. It seems that Bloom is more concerned with defining the term thinking. This is reflected in Rosenshine and Furst's observation that...

> Most observation systems have been used to "judge" teaching rather than evaluate its effectiveness. The widespread "synthetic," "divergent," and "evaluative," results more from the assumption that these types of thinking are important, and therefore should be prompted by the teacher, than from an attempt to relate types of classroom thinking to effective teaching. All too often, studies begin with the assumption that the nature of effective teaching and productive classroom thinking is already known.[28]

Parsons identifies two general types of questions: those that require little or no thought, and those that are thought-provoking.

> It is easy to see that a question which asks for the recall of what is already known requires little or no thought. However, it is not so easy to determine what kind of thinking a higher-level question asks for.
>
> In recent years there has been a lot of talk about different types of higher-level thinking in the

[28]Barak Rosenshine, and N. F. Furst, Research On Teacher Performance In Teacher Education, (Englewood Cliffs: Prentice-Hall, 1971) p. 37.

> classroom. We hear about divergent and convergent thinking, inquiry thinking, creative thinking, problem-solving, evaluative thinking, and so on. My purpose is not to present a complete model which takes all of these aspects of thinking into account, but to focus on one kind of thinking, which is basic to all of these--thinking with concepts.[29]

Parsons does not claim that thinking with concepts is the only type of higher-level thinking, or even that it is the most important type of thinking in the classroom. But he does claim that the ability to think with concepts is one important part of higher-level thinking. ICI is not meant to provide a complete picture of higher-level thinking, but simply to help the teacher determine how successful his questions are in the teaching for concept development.

In conclusion, it is generally accepted that teachers employ a large percentage of factual questions. It is often assumed that higher-level questions are more effective than lower-level questions, but this investigator finds little support for this claim. In order for higher-level questions to be meaningful, and thus provide meaningful information, they need to be categorized in several ways resulting in a multiple classification system. But such systems have not been effectively applied to the analysis of classroom interaction.

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[29] Parsons, op. cit., p. 21.

> The improvement of questioning techniques does not come easily. It is a lifetime chore but one, if done well, which contributes to becoming a better teacher and a better person. It is through such efforts that an instructor continues toward the path of wisdom leading to becoming a truly great teacher. [30]

The present study employs a multiple classification system for coding thinking levels in classroom interaction. It is hoped that it will also prove useful in studying the effectiveness of teacher use of higher-level questions.

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[30] Arthur A. Carin and Robert B. Sund, Developing Questioning Techniques, A Self-Concept Approach. (Ohio: Charles E. Merrill Publishing Co., 1971) p. 28.

CHAPTER III

THE PROCEDURES OF THE STUDY

I Procedure for Collecting Data

The data were obtained over a three month period through coding videotapes of classroom interaction of twelve teachers in the study sample. The teachers were volunteers from a senior high school. They were working with classes of students ranging from tenth to twelfth grades and teaching a variety of subjects. They were randomly assigned to two groups, experimental and control, to determine the effects of the ICI treatment on the conceptual level of classroom interaction. The six teachers in the experimental group were trained in using the ICI program to analyze videotapes of their own teaching in terms of the cognitive levels of teacher questions and student verbalization. The six teachers in the control group did not receive training in any self-analysis procedure, but were allowed to observe videotapes of themselves teaching, without benefit of any structured procedure for self-evaluation.

All videotapes were made on the Sony Model AV3400 portable videotape recorder and associated equipment. Each videotape was 30 minutes in length.

In Crooks' analysis of the Guided Self Analysis program, he concluded that the procedure for introducing the Guided Self Analysis categories would succeed on the secondary level if the focus was placed upon curriculum content. Instead of introducing categories in the context of coding videotapes to find out about the levels of thinking in classroom discussion, the categories could be introduced in the context of a curriculum workshop utilizing outlines of lesson plans. Attention would be drawn to one of the concepts in each plan which the teacher felt to be important for an understanding of the subject.

Such was the case of the present study. During the first meeting this investigator had with the six experimental teachers, discussion centered on the problems of planning an effective strategy for teaching concepts. Once various curricular ideas were identified, the categories were introduced as a means of organizing and analyzing those ideas. Video-taping was introduced last as a means of finding out how the organization of the material worked. A schedule of the workshop, taping and coding sessions is provided in Appendix A.

The independent variables in the study consist of two levels: the set of procedures followed by the experimental group under the ICI treatment, and the control procedures of viewing the videotapes on an unstructured basis.

The dependent variables consist of the specific classroom behaviors of both pupils and teachers.

The school in the present study is a senior high school. It sends a large proportion of its graduates to higher education, and has a predominantly white, middle class student body. The effects of these factors on the experimental results are not identified in the data and analyzed.

The teachers in the sample have not been controlled for subject matter or grade level differences. The sample includes teachers of grades ten, eleven and twelve, and of a variety of subject matters. No effort was made to match teachers on the basis of subject matter or grade level. The teachers were not controlled for differences in sex, teaching experience, age, attitude, or other teacher characteristics.

II Coding Categories

Each teacher in the study sample was videotaped two times prior to the coding sessions. Both teacher and students were allowed to view the results in order to minimize the effects of the presence of a video unit in the classroom. Then, under normal classroom

conditions, the teacher was videotaped four times for coding purposes. Under the direction of the investigator, the videotapes were coded, using the following coding categories presented in ICI:

Information Questions (Level 1) ask students to name and describe objects and events.

Comparison Questions (Level 2) ask students to point out similarities and differences between things.

Grouping Questions (Level 3) ask students to categorize or classify objects and events.

Analysis Questions (Level 4) are the most complex, and focus attention on causes, structure, functions, qualities, etc.

The categories utilized to code teacher responses are as follows:

Closure Response - responses which signal the end of pupil talk.

Sustaining Response - responses which encourage the student to continue talking and thinking until a "closure response" is elicited.

Extending Response - responses which encourage cognitive growth by allowing the student to extend a single idea.

This coding procedure provided data for an analysis of differences between teachers who received ICI treatment and teachers who simply observed themselves via videotape feedback.

III Summary of Data

Coding data for the four videotapes for each teacher is summarized in Tables. Table I presents the total number of questions asked per category by all teachers in the experimental group and in the control group. Table II provides the total number of responses given per category by all teachers in the experimental group and in the control group. Table III shows the total number of answers given per category by all students in the experimental group and in the control group.

The totals shown in Tables I, II, and III are based on the coding data for each videotape. From this raw data the percentage totals for categories of teacher questions, student answers and teacher responses in each group were determined and shown in Figure 1.

Tables I and III show that there were 1,790 pairs of teacher questions and student answers on the 48 videotapes, although the total

TABLE I

TOTAL NUMBER OF QUESTIONS ASKED PER CATEGORY BY ALL TEACHERS IN THE EXPERIMENTAL GROUP AND IN THE CONTROL GROUP.

TEACHER QUESTIONS (EXPERIMENTAL)

QUESTIONS	Tape 1	2	3	4	Total
INFORMATIONAL	89	90	97	66	342
COMPARISON	22	32	40	33	127
GROUPING	16	20	27	21	84
ANALYSIS	2	8	12	8	30
TOTAL	129	150	176	128	583

TEACHER QUESTIONS (CONTROL)

QUESTIONS	Tape 1	2	3	4	Total
INFORMATIONAL	78	57	69	57	261
COMPARISON	10	13	12	12	47
GROUPING	2	0	2	0	4
ANALYSIS	0	0	0	0	0
TOTAL	90	70	83	69	312

TABLE II

TOTAL NUMBER OF RESPONSES GIVEN PER CATEGORY BY ALL TEACHERS IN THE EXPERIMENTAL GROUP AND IN THE CONTROL GROUP.

TEACHER RESPONSES (EXPERIMENTAL)

RESPONSES	Tape 1	2	3	4	Total
CLOSURE	85	95	102	74	356
SUSTAIN	39	48	63	51	201
EXTEND	5	6	13	2	26
TOTAL	129	149	178	127	583

TEACHER RESPONSES (CONTROL)

RESPONSES	Tape 1	2	3	4	Total
CLOSURE	77	57	71	56	261
SUSTAIN	12	13	12	14	51
EXTEND	0	0	0	0	0
TOTAL	89	70	83	70	312

TABLE III

TOTAL NUMBER OF ANSWERS GIVEN PER CATEGORY BY ALL STUDENTS IN THE EXPERIMENTAL GROUP AND IN THE CONTROL GROUP

STUDENT ANSWERS (EXPERIMENTAL)

ANSWERS	Tape 1	2	3	4	Total
INFORMATIONAL	104	113	113	89	419
COMPARISON	15	22	37	26	100
GROUPING	8	11	20	9	48
ANALYSIS	1	4	2	4	11
TOTAL	128	150	172	128	578

STUDENT ANSWERS (CONTROL)

ANSWERS	Tape 1	2	3	4	Total
INFORMATIONAL	83	62	73	62	280
COMPARISON	7	8	9	7	31
GROUPING	0	0	1	0	1
ANALYSIS	0	0	0	0	0
TOTAL	90	70	83	69	312

FIGURE 1

PERCENTAGE OF TEACHER QUESTIONS, STUDENT ANSWERS AND TEACHER RESPONSES IN EACH CATEGORY IN THE EXPERIMENTAL GROUP AND CONTROL GROUP

Teacher Questions - Experimental

Total: 583 Questions

- Informational = 59%
- Comparison = 22%
- Grouping = 14%
- Analysis = 5%

Teacher Questions - Control

Total: 312 Questions

- Informational = 84%
- Comparison = 15%
- Grouping = 1%
- Analysis = 0%

Teacher Responses - Experimental

Total: 583 Responses

- Closure = 61%
- Sustain = 34%
- Extend = 5%

Teacher Responses - Control

Total: 312 Responses

- Closure = 84%
- Sustain = 16%
- Extend = 0%

Student Answers - Experimental

Total: 578 Answers

- Informational = 72%
- Comparison = 17%
- Grouping = 8%
- Analysis = 3%

Student Answers - Control

Total: 312 Answers

- Informational = 89%
- Comparison = 10%
- Grouping = 1%
- Analysis = 0%

figure for Table III's experimental group is 5 less than the total of Table I's experimental group. Five experimental group questions did not receive a response; therefore, they were not coded. The teachers' redirected questions were coded and appear in Table I and Table II. The total for the experimental group was 1, 166 and 624 for the control group. For both questions and answers, the majority falls into the Information category. Of teacher questions, 342 questions asked by the experimental teachers, and 261 questions asked by the control teachers were coded Information. Of student answers, 419 answers in classes taught by the experimental teachers, and 280 answers in classes taught by the control teachers were coded Information. Thus, 59% of the teacher questions, and 72% of the student answers in the experimental group were coded Information; in the control group, 84% of the questions, and 89% of the answers were coded Information.

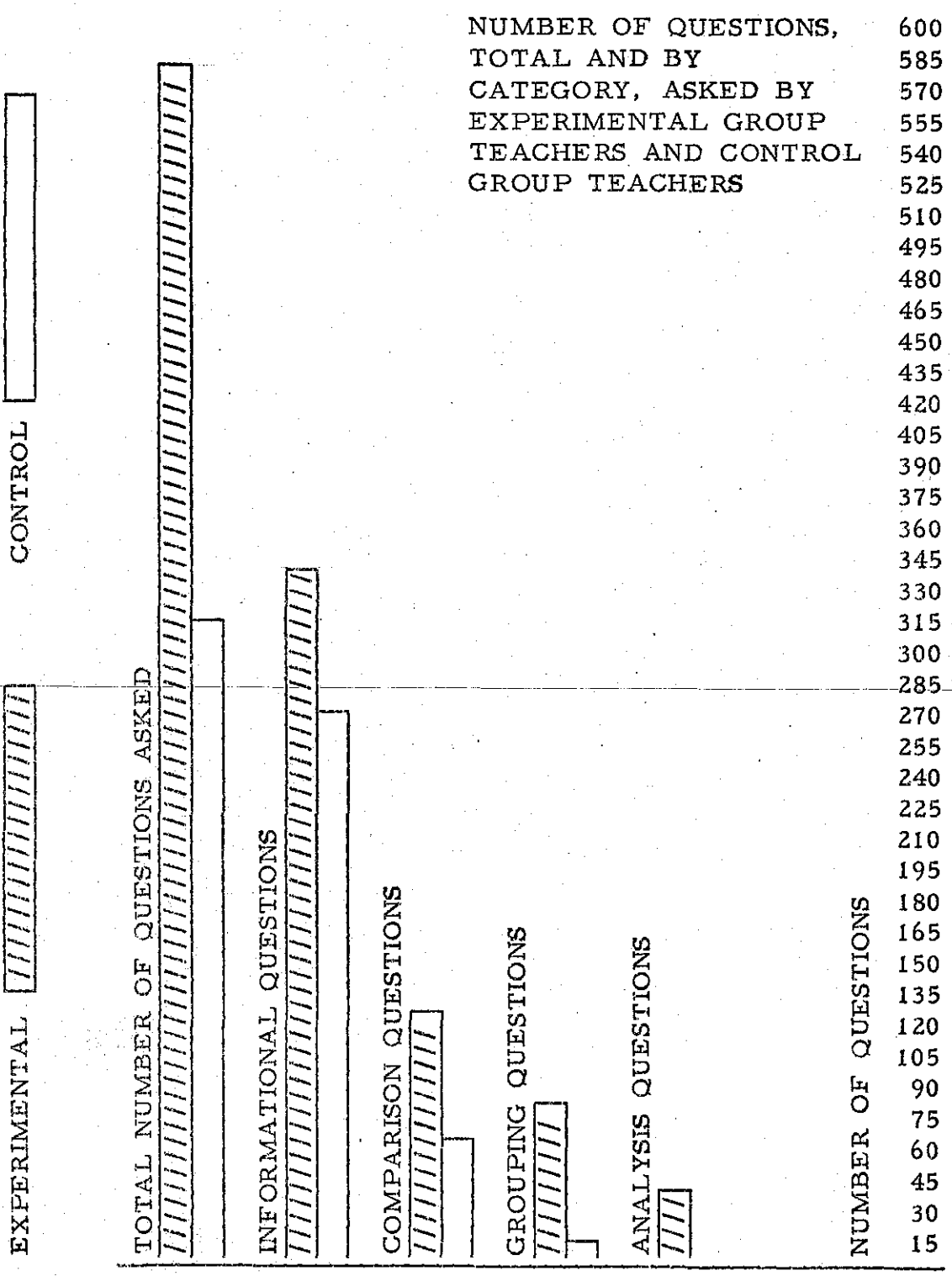
In terms of the other categories, the experimental group's questions totaled 22% (Comparison), 14% (Grouping) and 5% (Analysis) compared to the control group's 15% (Comparison), 1% (Grouping) and 0% (Analysis). Table III, Student Answers, showed the experimental group as having 17% (Comparison), 8% (Grouping), and 3% (Analysis)

compared to the control group's 10% (Comparison), 1% (Grouping) and 0% (Analysis).

Table II shows that there were a total of 896 teacher responses: 517 for the experimental group, and 313 for the control group. Thus 358, or 61% of the teacher-responses for the experimental group, and 262, or 84% of the teacher responses for the control group were coded Closure; while 202, or 34% of the experimental responses, and 51, or 16% of the control responses were coded Sustaining. The experimental group totaled 27 Extending responses or 5% while the control group did not achieve any Extending responses.

Figure 2 is a graphic illustration of the number of questions asked by teachers in each group for the four videotapings. The total number of questions as well as the break down according to category is charted.

FIGURE 2


NUMBER OF QUESTIONS, TOTAL AND BY CATEGORY, ASKED BY EXPERIMENTAL GROUP TEACHERS AND CONTROL GROUP TEACHERS
EXPERIMENTAL
CONTROL
TOTAL NUMBER OF QUESTIONS ASKED
INFORMATIONAL QUESTIONS
COMPARISON QUESTIONS
GROUPING QUESTIONS
ANALYSIS QUESTIONS
NUMBER OF QUESTIONS
600
585
570
555
540
525
510
495
480
465
450
435
420
405
390
375
360
345
330
315
300
285
270
255
240
225
210
195
180
165
150
135
120
105
90
75
60
45
30
15

CHAPTER IV

ANALYSIS OF THE DATA

I Hypotheses

The specific hypotheses under study are as follows:

H_1: ICI treatment will result in increased use of higher-level questions by teachers in the experimental group, as compared to the control group.

H_2: ICI treatment will result in increased use of higher-level answers by students in those classes taught by teachers in the experimental groups, as compared to the control group.

H_3: As teacher questions move to higher levels of thinking, so will student answers.

H_4: ICI treatment will result in increased use of encouraging responses by teachers in the experimental group, as compared to the control group.

II Transformation of Data into Index Form

The main focus of the study is on the use of higher-level questions and answers; therefore, it will be necessary to convert the coding data into a numerical scale which reflects the value of

each category. The index for both questions and answers is given by the following formula:

$$\text{Index} = \frac{1\,I + 2\,C + 3\,G + 4\,A}{\text{Total}}$$

The index is formed by dividing the sum of Information, Comparison, Grouping and Analysis questions or answers, by the total number of questions or answers.

The videotape which contains nothing but lower-level Information questions, or answers, has an index value of 1.00, as the weighted total is the same as the total number of questions, or answers, and the larger the index, the greater the use of higher-level questions or answers.

A Comparison question counts for twice the value of an Information question. A Grouping question counts for three times the value of an Information question, and an Analysis question counts for four times the value of an Information question. This is not meant to imply that an Analysis question requires four times the thinking that an Information question requires, while a Grouping question requires only three times that amount of thinking. However, on the basis of the category definitions, each successive type of question or answer

represents an additional step in conceptual thinking. Therefore, the construction of the index represents a means for reflecting the numerical value of the categories.

Table IV presents the index of total questions asked by each teacher in the experimental group and control group.

Table V presents the index of total answers given by students in the experimental group and control group.

The data for categories of teacher responses to student statements will also be converted to index form. This index will be similar to that for questions and answers, and is given by this formula:

$$\text{Index} = \frac{1\,C + 2\,S + 3\,E}{\text{Total}}$$

Table VI shows the index of total responses given by each teacher in the experimental group and control group. A tape which contains nothing but Closure responses will have an index value of 1.00. Sustaining responses will be coded as 2.00 and Extending responses 3.00 because they are considered to be encouraging responses. Extending responses ask the student to develop his thinking further and Sustaining responses simply encourage him to continue talking. See Appendix B for a sample of the coding form.

TABLE IV

INDEX OF TOTAL QUESTIONS ASKED BY EACH TEACHER IN THE EXPERIMENTAL GROUP AND CONTROL GROUP

	TEACHER QUESTIONS (EXPERIMENTAL)			
TEACHERS	Tape 1	2	3	4
A.	1.84	2.05	2.07	1.78
B.	1.43	1.51	1.57	1.47
C.	1.22	1.23	1.55	1.64
D.	1.67	1.69	2.42	1.80
E.	1.20	1.20	1.60	1.36
F.	1.52	1.60	1.52	2.22

	TEACHER QUESTIONS (CONTROL)			
TEACHERS	Tape 1	2	3	4
G.	1.00	1.35	1.00	1.21
H.	1.12	1.08	1.14	1.00
I.	1.13	1.00	1.18	1.25
J.	1.07	1.22	1.19	1.25
K.	1.35	1.33	1.33	1.30
L.	1.13	1.00	1.29	1.27

TABLE V

INDEX OF TOTAL ANSWERS GIVEN BY STUDENTS IN THE EXPERIMENTAL GROUP AND CONTROL GROUP

	STUDENT ANSWERS (EXPERIMENTAL)			
TEACHERS	Tape 1	2	3	4
A.	1.32	1.64	1.39	1.14
B.	1.34	1.33	1.35	1.36
C.	1.16	1.00	1.34	1.18
D.	1.32	1.27	1.76	1.61
E.	1.25	1.00	1.55	1.27
F.	1.13	1.60	1.31	1.62

	STUDENT ANSWERS (CONTROL)			
TEACHERS	Tape 1	2	3	4
G.	1.00	1.14	1.00	1.07
H.	1.00	1.16	1.07	1.00
I.	1.13	1.00	1.18	1.00
J.	1.07	1.11	1.12	1.08
K.	1.18	1.11	1.25	1.30
L.	1.04	1.00	1.14	1.18

TABLE VI

INDEX OF TOTAL RESPONSES GIVEN BY EACH TEACHER IN THE EXPERIMENTAL GROUP AND CONTROL GROUP

	TEACHER RESPONSES (EXPERIMENTAL)			
TEACHERS	Tape 1	2	3	4
A.	1.64	1.53	1.85	1.56
B.	1.43	1.37	1.39	1.47
C.	1.05	1.17	1.44	1.45
D.	1.46	1.37	1.90	1.50
E.	1.20	1.20	1.40	1.36
F.	1.33	1.56	1.31	1.22

	TEACHER RESPONSES (CONTROL)			
TEACHERS	Tape 1	2	3	4
G.	1.00	1.35	1.09	1.43
H.	1.12	1.33	1.00	1.00
I.	1.06	1.00	1.25	1.08
J.	1.00	1.00	1.19	1.16
K.	1.18	1.05	1.25	1.23
L.	1.21	1.00	1.07	1.18

Test for H_1

Table VII converts the index from Table IV (Teacher Questions - Experimental) into a "Ranked Index." The ranking has been totaled by column in order to obtain a single ranking for each round of videotapes for the experimental group. The same procedure was followed in Table VIII for the control group.

The mean total rankings were then plotted in Figure 3 to present the contrast between the experimental group and the control group more graphically. One line plots the means of the total column rankings for each taping for the experimental group, and another line plots the means of the total column rankings for each taping in the control group.

The first study hypothesis states: the ICI treatment will result in increased use of higher-level questions by teachers in the experimental group, as compared to the control group.

The procedure used to test H_1 was an Analysis of Variance with Repeated Measures. Table IX illustrates the resulting calculations.

$$F = \frac{2.51}{.142} = 17.68$$

TABLE VII

EXPERIMENTAL TEACHERS' QUESTIONS INDEX CONVERTED INTO RANKED INDICES

TEACHER QUESTIONS
(EXPERIMENTAL)

TEACHERS	INDEX Tape 1	2	3	4	RANKED INDEX Tape 1	2	3	4
A.	1.84	2.05	2.07	1.78	2	3	4	1
B.	1.43	1.51	1.57	1.47	1	3	4	2
C.	1.22	1.23	1.55	1.64	1	2	3	4
D.	1.67	1.69	2.42	1.80	1	2	4	3
E.	1.20	1.20	1.60	1.36	1.5	1.5	4	3
F.	1.13	1.60	1.52	2.22	1	3	2	4
				TOTAL	7.5	14.5	21.0	17.0

TABLE VIII

CONTROL TEACHERS' QUESTIONS INDEX CONVERTED INTO RANKED INDICES

TEACHER QUESTIONS
(CONTROL)

TEACHERS	INDEX				RANKED INDEX			
	Tape 1	2	3	4	Tape 1	2	3	4
G.	1.00	1.35	1.00	1.21	1.5	4	1.5	3
H.	1.12	1.08	1.14	1.00	3	2	4	1
I.	1.13	1.00	1.18	1.25	2	1	3	4
J.	1.07	1.22	1.19	1.25	1	3	2	4
K.	1.35	1.33	1.33	1.30	4	2.5	2.5	1
L.	1.13	1.00	1.29	1.27	2	1	4	3
				TOTAL	13.5	13.5	17.0	16.0

FIGURE 3

MEAN TOTAL RANKINGS CHARTED BY VIDEOTAPE FOR TEACHERS' QUESTIONS

MEAN TOTAL RANKINGS

TAPES	1	2	3	4
EXPERIMENTAL GROUP	1. 25	2. 42	3. 50	2. 83
CONTROL GROUP	2. 25	2. 25	2. 83	2. 66

EXPERIMENTAL GROUP _____

CONTROL GROUP -

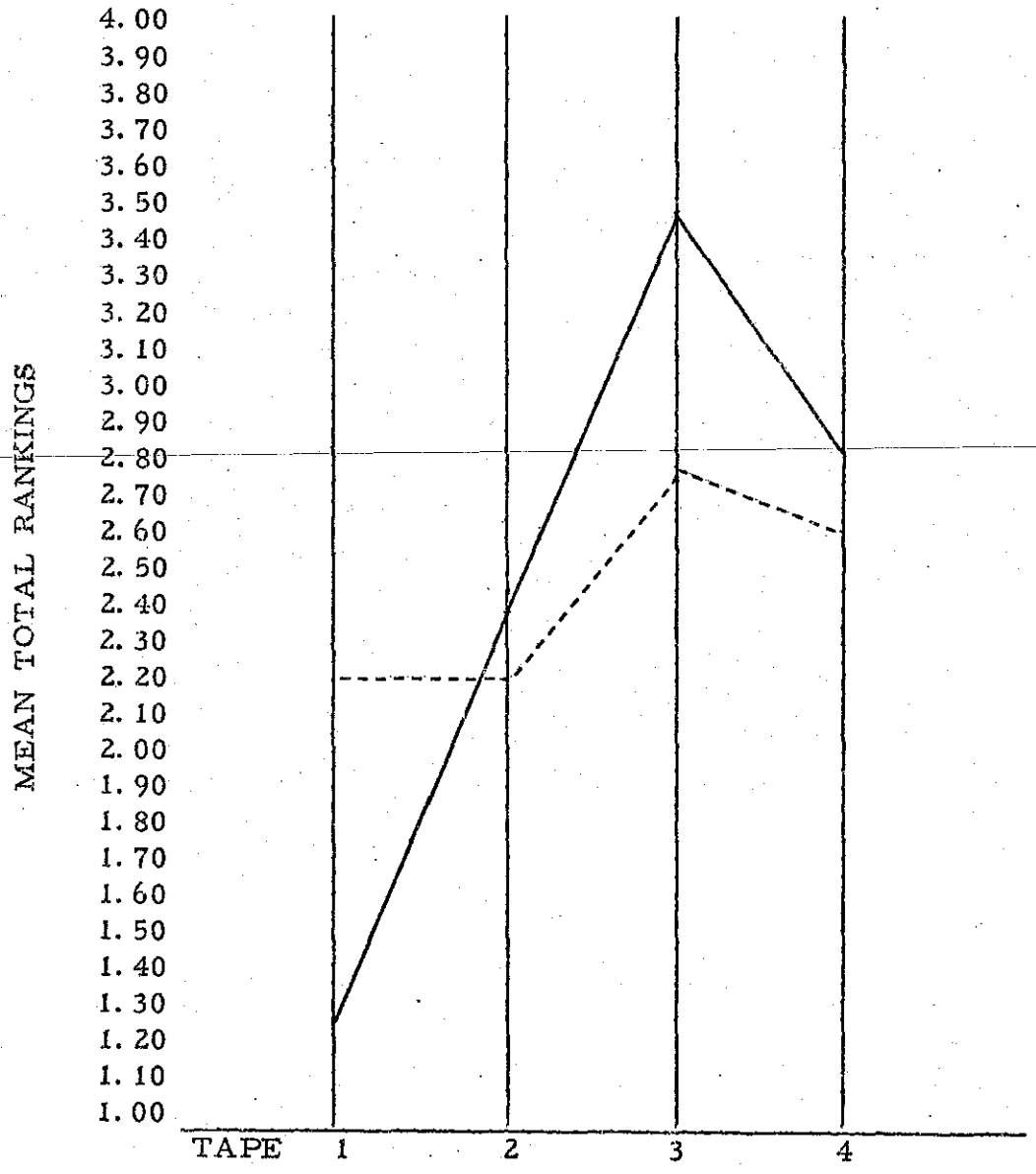


TABLE IX

ANALYSIS OF VARIANCE COMPUTATIONS
FOR TEACHERS' QUESTIONS INDICES

SOURCE OF VARIATION	SS	df	MS	F
Between Subjects	3.93	11	2.51	
Between Groups	2.51	1	.142	17.68
Subjects Within Groups	1.42	10		
Within Subjects	1.23	36	.09	
Tapes	.27	3	.037	3.21
Groups X Tapes	.11	3	.028	1.32
Tapes X Subjects Within Groups	.85	30		

The observed F Value calculated between groups exceeded the critical F value of 10.04 for one and ten degrees of freedom, thus rejecting the null hypothesis at the .01 significance level.

It can therefore be concluded that the ICI treatment resulted in a significant increased use of higher-level questions by teachers in the experimental group at the .01 level, as compared to the control group due to the non chance difference between both groups.

The F values for Within Group Variance was not significant at either the .01 or .05 levels of significance, thus demonstrating the fluctuation of individual scores in each group, and the lack of interaction between taping sessions. The modest F-ratio in the Within Subject category can be accounted for by considering several external variables: limitations of time on tapes during coding sessions (20 - 30 minutes); differences in subject matter, administrative interruptions; the difficulty of the particular concept being taught. Therefore, it may also be concluded that the impact of the ICI method on the experimental group's questioning strategy resulted in consistently higher scores throughout the four videotaping sessions as compared to the control group scores.

Test for H_2

The procedure for testing H_2 is the same as that for testing H_1.

Table X shows the index values for student answers for each videotape, and the rankings of the indices for each class of students over the four tapings. Table XI shows the same information collected on those classes of students taught by the control group teachers. Figure 4 plots the mean total rankings.

The second study hypothesis states: the ICI treatment will result in increased use of higher-level answers in those classes taught by teachers in the experimental groups, as compared to the control group.

Table XII shows the resulting calculations of an Analysis of Variance with Repeated Measures procedure.

$$F = \frac{.93}{.031} = 30 .$$

The observed F Value calculated between groups exceeded the critical F Value of 10.04 for one and ten degrees of freedom, thus rejecting the null hypothesis at the .01 significance level.

TABLE X

EXPERIMENTAL GROUP STUDENTS' ANSWERS INDEX CONVERTED INTO RANKED INDICES

TEACHERS	STUDENT ANSWERS (EXPERIMENTAL) INDEX				RANKED INDEX			
	Tape 1	2	3	4	Tape 1	2	3	4
A.	1.32	1.64	1.39	1.14	2	4	3	1
B.	1.34	1.33	1.35	1.36	2	1	3	4
C.	1.16	1.00	1.34	1.18	2	1	4	3
D.	1.32	1.27	1.76	1.61	2	1	4	3
E.	1.25	1.00	1.55	1.27	2	1	4	3
F.	1.13	1.60	1.31	1.62	1	3	2	4
				TOTAL	11.0	11.0	24.0	18.0

TABLE XI

CONTROL GROUP STUDENTS' ANSWERS INDEX CONVERTED INTO RANKED INDICES

STUDENT ANSWERS
(CONTROL)

TEACHERS	INDEX Tape 1	2	3	4	RANKED INDEX Tape 1	2	3	4
G.	1.00	1.14	1.00	1.07	1.5	4	1.5	3
H.	1.00	1.16	1.07	1.00	1.5	4	3	1.5
I.	1.13	1.00	1.18	1.00	3	1.5	4	1.5
J.	1.07	1.11	1.12	1.08	1	3	4	2
K.	1.18	1.11	1.25	1.30	2	1	3	4
L.	1.04	1.00	1.14	1.18	2	1	3	4
				TOTAL	11.0	14.5	18.5	16.0

FIGURE 4

MEAN TOTAL RANKINGS CHARTED BY VIDEOTAPE FOR STUDENTS' ANSWERS

MEAN TOTAL RANKINGS

TAPES	1	2	3	4
EXPERIMENTAL GROUP	1.83	1.83	4.00	3.00
CONTROL GROUP	1.83	2.41	3.08	2.66

EXPERIMENTAL GROUP _____

CONTROL GROUP - - - - - - - - - - - - - - - - - - -

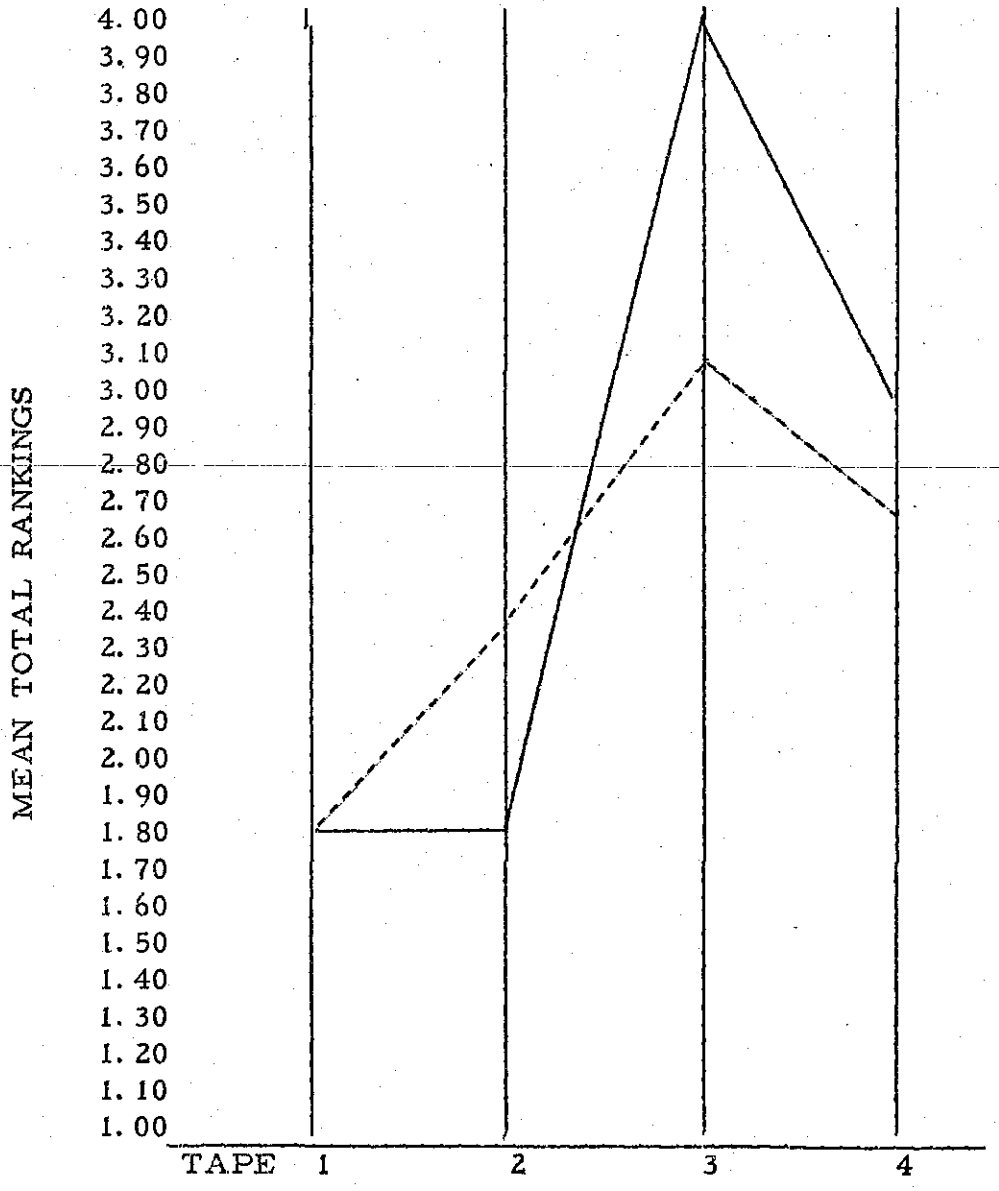


TABLE XII

ANALYSIS OF VARIANCE COMPUTATIONS
FOR STUDENTS' ANSWERS INDICES

SOURCE OF VARIATION	S	df	MS	F
Between Subjects	1.04	11		
Between Groups	.93	1	.93	30
Subjects Within Groups	.31	10	.031	
Within Subjects	.74	36		
Tapes	.10	3	.033	1.65
Groups X Tapes	.03	3	.01	.5
Tapes X Subjects Within Groups	.61	30	.02	

It can therefore be concluded that the ICI treatment resulted in increased use of higher-level answers in those classes taught by teachers in the experimental groups, as compared to the control group due to the non chance difference between both groups.

It may also be concluded that due to the modest F value for Within Group Variance, the impact of the treatment remains similar for all teachers.

Test for H_3

The third study hypothesis states: as teacher questions move to higher levels of thinking, so will student answers.

The Spearman Rank Correlation Coefficient was employed to test H_3.

The critical value of r at the .01 level of significance is .780. The calculated value was .933 thus demonstrating that there is a strong degree of correspondence between cognitive level of teacher questions and student answers.

Therefore, it may be concluded that as teacher questions move to higher levels of thinking, so will student answers.

Test for H_4

The procedure for testing this hypothesis is the same as that for testing H_1 and H_2.

Table XIII shows the index values for teacher responses for each videotape, and the rankings of the indices for each teacher over the four tapings. Table XIV shows the same information collected on those tapes made by the control group teachers. Figure 5 plots the mean total rankings.

The fourth study hypothesis states: the ICI treatment will result in increased use of encouraging responses by teachers in the experimental group, as compared to the control group.

The procedure used to test H_4 was an Analysis of Variance with Repeated Measures. Table XV illustrates the resulting calculations.

$$F = \frac{1.00}{.049} = 20.41$$

The observed F Value calculated between groups exceeded the critical F Value of 10.04 for one and ten degrees of freedom, thus rejecting the null hypothesis at the .01 significance level.

TABLE XIII

EXPERIMENTAL GROUP TEACHERS' RESPONSES INDEX CONVERTED INTO RANKED INDICES

TEACHER RESPONSES
(EXPERIMENTAL)

TEACHERS	INDEX Tape 1	2	3	4	RANKED INDEX Tape 1	2	3	4
A.	1.64	1.53	1.85	1.56	3	1	4	2
B.	1.43	1.37	1.39	1.47	3	1	2	4
C.	1.05	1.17	1.44	1.45	1	2	3	4
D.	1.46	1.37	1.90	1.50	3	1	4	2
E.	1.20	1.20	1.40	1.36	1.5	1.5	4	3
F.	1.33	1.56	1.31	1.22	3	4	2	1
				TOTAL	14.5	10.5	19.0	16.0

TABLE XIV

CONTROL GROUP TEACHERS' RESPONSE INDEX CONVERTED INTO RANKED INDICES

TEACHER RESPONSES
(CONTROL)

TEACHERS	INDEX Tape 1	2	3	4	RANKED INDEX Tape 1	2	3	4
G.	1.00	1.35	1.09	1.43	1	3	2	4
H.	1.12	1.33	1.00	1.00	3	4	1.5	1.5
I.	1.06	1.00	1.25	1.08	2	1	4	3
J.	1.00	1.00	1.19	1.16	1.5	1.5	4	3
K.	1.18	1.05	1.25	1.23	2	1	4	3
L.	1.21	1.00	1.07	1.18	4	1	2	3
				TOTAL	13.5	11.5	17.5	17.5

FIGURE 5

MEAN TOTAL RANKING CHARTED BY VIDEOTAPE FOR TEACHERS' RESPONSES

MEAN TOTAL RANKINGS

TAPES	1	2	3	4
EXPERIMENTAL GROUP	2.42	1.75	3.16	2.66
CONTROL GROUP	2.25	1.92	2.92	2.92

EXPERIMENTAL GROUP ———————

CONTROL GROUP - - - - - - - - - - - - - - - - - -

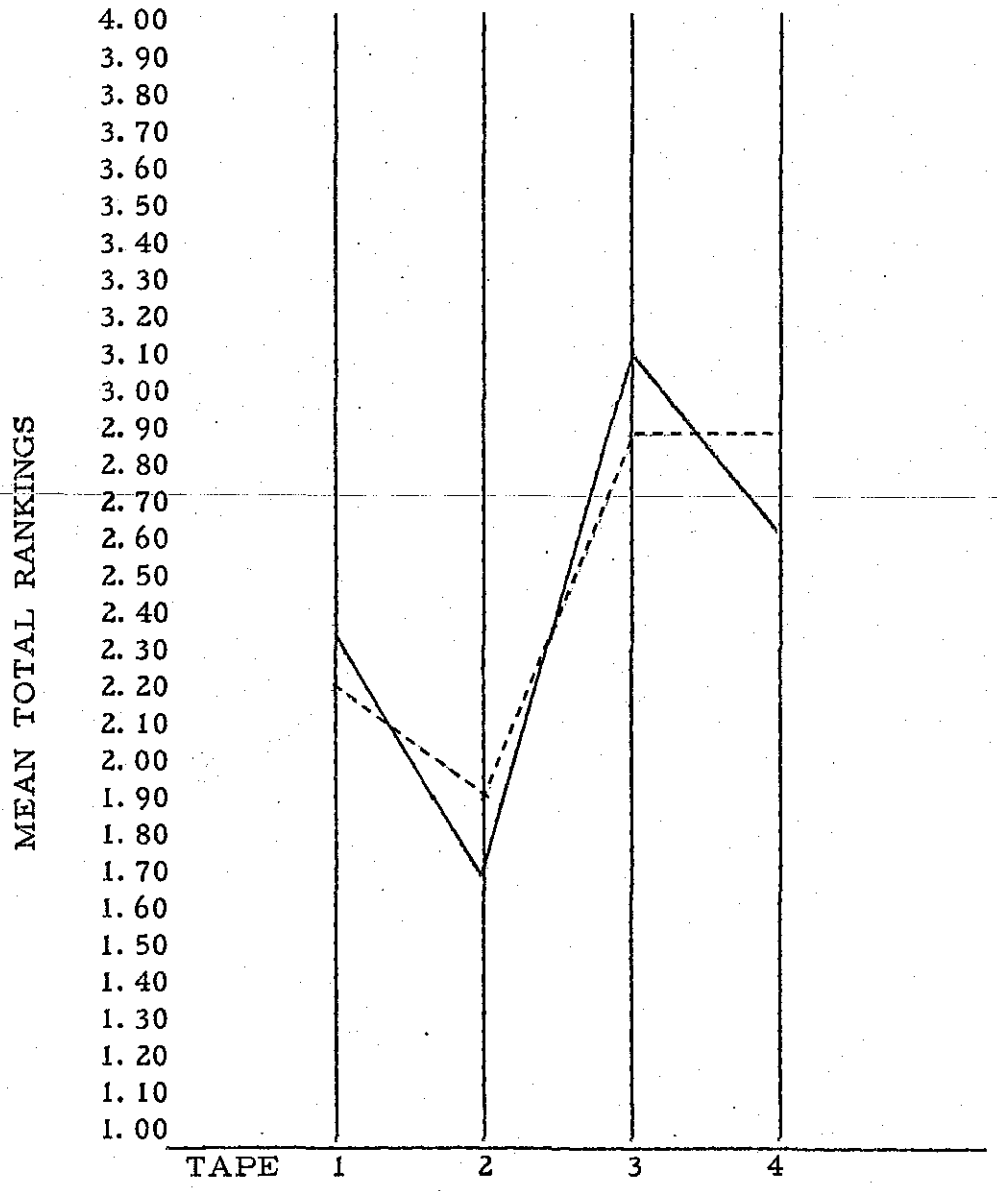


TABLE XV

ANALYSIS OF VARIANCE COMPUTATIONS FOR TEACHERS' RESPONSES INDICES

SOURCE OF VARIATION	SS	df	MS	F
Between Subjects	1.49	11		
Between Groups	1.00	1	1.00	20.41
Subjects Within Groups	.49	10	.049	
Within Subjects	.71	36		
Tapes	.11	3	.037	2.05
Groups X Tapes	-.05	3	-.017	-.94
Tapes X Subjects Within Groups	.55	30	.018	

It can therefore be concluded that the ICI treatment resulted in significant increased use of encouraging responses by teachers in the experimental group at the .01 level, as compared to the control group due to the non chance difference between both groups.

It may also be concluded that due to the modest F Value for Within Group Variance, the impact of the treatment remains similar for all teachers.

CHAPTER V

SUMMARY AND CONCLUSIONS

I SUMMARY

Introduction

The purpose of the present study was to determine whether the ICI treatment, as compared to self-observation alone, resulted in (1) increased use of higher-level questions by teachers, (2) increased use of higher-level answers by students in response to those questions, and (3) increased use of encouraging responses by teachers. The findings in the study supported the prediction that ICI resulted in all three of these areas. In addition to the above, support was found for the prediction that as teacher questions move to higher levels of thinking, so do student answers.

The Problem

Specifically, the problem of this study was to determine the effects of the ICI treatment on the cognitive level of teacher questions and student answers.

Limitations of the Study

The study focused on two guidebooks in the ICI program -- "Questioning for Levels of Thinking," and "Responding to Pupils." The study did not attempt to measure student retention of what was taught under the ICI system nor did it outline a specific series of steps which the teacher in the experimental group must follow.

Hypotheses

The first hypothesis was that the ICI treatment will result in increased use of higher-level questions by teachers in the experimental group, as compared to the control group.

The second hypothesis was that the ICI treatment will result in increased use of higher-level answers by students in those classes taught by teachers in the experimental group, as compared to the control group.

The third hypothesis was that as teacher questions move to higher levels of thinking, so will student answers.

The fourth hypothesis was that ICI treatment will result in increased use of encouraging responses by teachers in the experimental group, as compared to the control group.

Procedures

The design of the study involved a total population of twelve volunteer teachers who were randomly assigned to two groups -- experimental and control. The six teachers in the experimental group were trained in using the ICI program.

All the teachers involved in the study were videotaped on two occasions prior to recording the coding tapes in order to minimize the effects of the presence of a video unit in the classroom, and four times over a three month period for coding purposes.

A total of forty-eight 30 minute tapes were coded for the conceptual levels of questions, levels of student responses, and levels of teacher responses. Each experimental teacher was involved in the coding of his videotape; whereas each control group teacher was allowed to view his tape without benefit of the ICI procedures.

This investigator assisted the experimental group teachers in analyzing their respective tapes and instructed them in their planning of future tapes.

The coded results were then tested for significance by means of an Analysis of Variance with Repeated Measures test and the Spearman Rank Correlation Coefficient test.

Findings

1. Teachers utilizing the ICI program increase significantly their use of higher-level questions over teachers who observe themselves teaching on videotape without benefit of a structured self-evaluation procedure.
2. Students in classes taught by teachers using ICI significantly increase their use of higher-level answers over the use of higher-level answers by students in classes taught by teachers who observe themselves teaching on videotape, but do not evaluate their teaching.
3. A significant degree of correspondence exists between the level of thinking asked for in a teacher question, and the level of thinking manifest in the student answer.
4. Teachers utilizing the ICI program increase significantly their use of encouraging responses to student statements over the use of encouraging responses by teachers who simply observe themselves teaching on videotape.

Observations and Inferences

The central question in the study was to determine whether ICI treatment resulted in increased use of both higher-level questions and answers, as well as the relation between the cognitive levels of

teacher questions and student answers. Attention was not centered on measuring student retention of information or learning about a particular subject.

Since the ICI treatment resulted in significant increased use of higher-level questions, answers, and encouraging responses; and since there is a significant degree of correspondence between the level of thinking asked for in a teacher question, and the level of thinking manifest in the student answers; it may be argued that ICI resulted in more effective teaching because the teacher's use of more higher-level questions led to student use of more higher-level answers.

In addition, it may be argued that the use of ICI treatment resulted in more effective learning being accomplished on the basis of there being more higher-level student answers in the discussions.

Figures 3 (page 51), 4 (page 57), and 5 (page 63), which charted the mean total rankings for both the experimental and control groups, upheld the prediction of an increase in the use of higher-level questions, answers, and responses for the experimental group over the first three tapes. The fourth tape, however, resulted in less use of higher-level questions and responses thus affecting student answers. This reverse in the upward trend in the final taping

probably was caused by an unexpected external pressure. The fourth tape was recorded in the third week of December, 1974, just before the close of school for Christmas vacation. At this time, teachers and students are typically unenthusiastic about school work, and discussion in the school confirmed the prevalence of this attitude. It can be inferred, therefore, that the decline in treatment effects shown in the data for the fourth videotape resulted from an attitude shift on the part of teachers and students.

The present study confirmed that ICI teachers asked fewer Information type questions/responses and received fewer Information answers from students compared to teachers who did not utilize the ICI method. In the analysis of the data, Figure 1 (page 38) showed that 59% of the questions and 72% of the answers in the experimental group, consisted of an Information type question/response. The proportion of Information questions in the control group was 84% Information questions and 89% Information answers.

The general finding that teachers ask a high proportion of lower-level Information questions was upheld by this study. Add to this the finding of a strong degree of correspondence between cognitive levels of teacher questions and student answers, it might

be inferred that most of the thinking done in the classroom discussion is at the Information level.

Data indicated that the ICI treatment prompted teachers to ask more questions. Figure 2 (page 41) showed a significant increase in the number of questions asked by the experimental group teachers as compared to the number of questions asked by the teachers not exposed to the ICI procedure.

The data found in Table VII (page 49) - Experimental Teachers' Question Index - compared to Table VIII (page 50) - Control Teachers' Question Index, indicated that not only did the experimental group show a superiority over the control group at the time of the first taping, they continued to surpass their subsequent performance as shown by the rankings in Fig. 3 (page 51).

Data contained in Table X (page 55) - Experimental Students' Answer Index also showed a superiority over the data found in Table XI (page 56) - Control Students' Answer Index at the time of the first taping. Subsequent tapings resulted in a continuation of the pattern of superiority in Experimental group answers over control group answers, as shown by the rankings in Fig. 4 (page 57).

The decline in the mean total ranking for experimental teacher responses on the second and fourth tape in Figure 5 (page 63)

can be accounted for with information received from the experimental group teachers. Interviews at the close of the study disclosed that four experimental group teachers did not agree with the idea that students should be sustained during classroom discussions. The teachers agreed that if a student was encouraged to continue speaking, this opportunity would enable him to develop his thinking further; but, they believed that encouraging responses were dangerous because they would open the door for disruptive behavior from the other students. Students not in the process of responding might become bored and begin creating problems. Therefore, it was better to move rapidly from one student to another in order to maintain behavior control during the discussion.

Relating ICI to Effective Planning

The procedure for implementing the ICI program represented a shift in emphasis from the old GSA format. GSA introduced only coding categories and videotaping procedures without providing the teacher with guidance toward integrating the procedures into his lesson plan.

The results of the present study proved that the experimental group responded favorably when they were able to see the relation between the categories and the organization of their subject matter. The introductory workshop and two videotape sessions prior to coding helped the teachers see how the ICI model may be applied in working with the concepts which they are familiar with. This led the teachers to an awareness that planning their questioning strategies in advance would lead to successful organization of curriculum content and effectiveness of their strategy.

The ICI procedure tended to encourage the experimental teachers to plan and use structured questioning strategies which are based on a conceptual analysis of the content of the discussion. It was found that in order to be successful in this endeavor, a teacher must be very receptive to the idea of using the ICI coding categories to plan improved strategies for teaching concepts. ICI is not a

method which focuses upon the mere phrasing of higher-level questions; rather, it is a method of analyzing concepts in a teaching plan and planning a conceptual questioning strategy on the basis of the analysis. The ICI material makes it very clear that the art of asking higher-level questions has more to it than the ability to phrase questions appropriately--that it consists largely in asking questions which are based on clear thinking tasks related to the concepts under discussion. And from this it follows that the prior planning of a questioning strategy is very important if that strategy is to be effective.

In the final analysis, the data suggest that when a teacher analyzes videotapes of his behavior in the classroom utilizing the ICI material, he will become aware of his strengths and weaknesses and move toward improvement within his individual teaching style.

II CONCLUSIONS

Conclusions

First, the ICI treatment resulted in a significant increased use of higher-level questions by teachers in the experimental group, as compared to the control group.

Second, the ICI treatment resulted in a significant increased use of higher-level answers in those classes taught by teachers in the experimental group, as compared to the control group.

Third, as teacher questions moved to higher levels of thinking, so did student answers.

Fourth, the ICI treatment resulted in significant increased use of encouraging responses by teachers in the experimental group, as compared to the control group.

Implications for Further Research

The ICI system should be restudied under circumstances similar to the present study in order to see if ICI results in even more changes in teaching behavior. Ideally, the population should be increased and samples should be drawn from different schools as well as different communities.

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APPENDIX

APPENDIX (A)

EXPERIMENTAL STUDY

WORKSHOP, VIDEOTAPING, AND CODING SCHEDULE

(SEPT. - DEC. 1974)

(I) September 27 - October 4

Individual meetings were held with teachers in both the experimental and control groups in order to explain their individual roles in the study project as well as provide a general overview of the procedures to be followed for taping and critique sessions.

(II) October 7 - October 24

Two video tape sessions with teachers and classes in both the experimental and control group were conducted prior to the recording of coding tapes in order to minimize the effects of the video camera in the classroom.

(III) October 25

A curriculum workshop was held with the six experimental group teachers. Each teacher was asked to bring to the meeting a copy of a recent lesson plan. The coding

categories were introduced as a means of organizing and analyzing the major concepts contained in each lesson plan.

(IV) October 28 - November 1

The first video-taping sessions for the purpose of producing a coding tape were conducted during this week. All tapes were recorded by high school students who are members of the school's Video Tape Recording class.

(V) November 4 - November 8

Each experimental group teacher met with the investigator in order to code their tape. Control group teachers were allowed to view their tape without benefit of the coding procedure. The investigator coded the control group tapes.

(VI) November 11 - November 15

Both the experimental group teachers and the control group teachers were videotaped a second time.

(VII) November 18 - November 20

Coding sessions for the experimental group teachers and viewing sessions for the control group teachers were again

held. The results were recorded and compared to the first taping session.

(VIII) November 25 - November 29

The third videotaping sessions were completed by experimental and control group teachers.

(IX) December 2 - December 6

Coding sessions for the experimental group teachers and viewing sessions for the control group teachers were held and the results were again recorded.

(X) December 9 - December 20

The fourth videotaping sessions were completed by experimental and control group teachers.

(XI) December 16 - December 20

The final coding session was held for the experimental group teachers and the control group teachers were allowed to view their tapes.

ICI CODING FORM FOR QUESTIONS ASKED
PER CATEGORY BY TEACHERS AND STUDENTS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
INFORMATION																															
COMPARISON																															
GROUPING																															
ANALYSIS																															

ICI CODING FORM FOR RESPONSES GIVEN
PER CATEGORY BY THE TEACHER

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
CLOSURE																															
SUSTAIN																															
EXTEND																															